

# PATENT ABSTRACTS OF JAPAN

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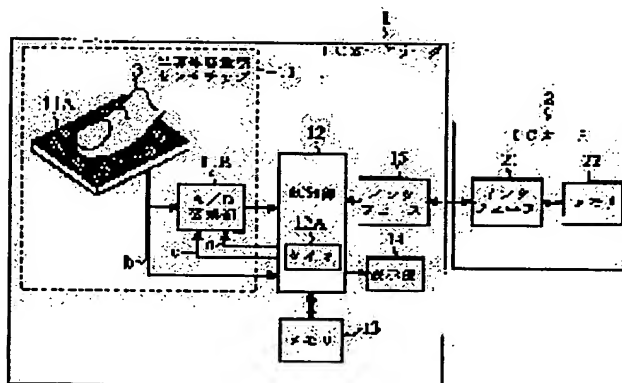
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(54) FINGERPRINT COLLATION DEVICE

(57) Abstract:

**PROBLEM TO BE SOLVED:** To accurately detect a fingerprint image of a person's fingertip having individual differences, such as a dry skin or a fatty skin.

**SOLUTION:** In this collation device, when an IC card 2 is inserted into an IC card reader 1, the IC card reader 1 reads a waiting time, parameters and fingerprint data specific to the user from the IC card 2, sets the parameters peculiar to the user to an A/D converting part 11B of a sensor chip 11, and sets the waiting time specific to the user to a timer 12A. When a finger 3 of the user is pressed against the sensor chip 11, the timer 12A is started, and the sensor chip 11 is started after a time of the timer 12A is up, to detect a fingerprint of the finger 3. The fingerprint data detected by the sensor chip 11 are collated with the fingerprint data from the IC card 2 to identify the user.



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CLAIMS

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## [Claim(s)]

[Claim 1] The storage section which keeps the individual humanity news containing the parameter of the capacity mold sensor chip which consists of a semi-conductor which detects a fingerprint, and a user's fingerprint image data and said capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data detected with said capacity mold sensor chip, and the fingerprint data of said storage section, The setting section which sets up the parameter of said storage section to said capacity mold sensor chip, It has the control section which this capacity mold sensor chip is started [ control section ] and makes said fingerprint image data detect after a setup of the parameter to said capacity mold sensor chip by said setting section. Said fingerprint authentication section The fingerprint collation device characterized by collating the fingerprint image detected with this capacity mold sensor chip after starting of said capacity mold sensor chip of said control section, and the fingerprint data of said storage section, and performing fingerprint authentication.

[Claim 2] In claim 1, said storage section keeps the latency time at the time of fingerprint image detection of said capacity mold sensor chip as said individual humanity news. It is the fingerprint collation device which is equipped with the detecting element which detects contact of the finger to said capacity mold sensor chip, and is characterized by for said control section starting said capacity mold sensor chip after latency-time progress of said storage section after contact of a finger is detected by said detecting element, and making detection of said fingerprint image start.

[Claim 3] The fingerprint collation device characterized by preparing IC card reader which reads the data of said IC card, and preparing said capacity mold sensor chip, said fingerprint authentication section, said setting section, said control section, and a detecting element in said IC card reader while preparing said storage section which keeps said individual humanity news in an IC card in claim 1 or claim 2.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the fingerprint collation device which performs collating with the fingerprint data registered beforehand and the fingerprint data detected by the semi-conductor capacity mold sensor.

[0002]

[Description of the Prior Art] The semi-conductor capacity mold sensor used for this kind of fingerprint collation device detects the irregularity of human being's fingerprint as a capacity difference, and generates it as a shade image. Said fingerprint collation device registers a user's fingerprint data beforehand, when attesting a user using a fingerprint. and -- if the fingerprint data which generated fingerprint data and were generated from the detected fingerprint image are compared with said fingerprint data registered and both are in agreement, while making the irregularity of this user's fingerprint detect as a fingerprint image based on the capacity difference of a capacity mold sensor as mentioned above, when a user's finger is stamped on said semi-conductor capacity mold sensor -- a user -- it is recognized as his being him.

[0003]

[Problem(s) to be Solved by the Invention] Generally, human being's fingertip has individual difference like the desiccation skin or the oily skin skin. Since the semi-conductor capacity mold sensor had detected the fingerprint image of the fingertip of human being who has such individual difference on the same conditions regardless of individual difference, the conventional fingerprint collation device had the technical problem that an exact fingerprint image required for collating was not obtained. Therefore, this invention aims at performing exact detection, when detecting the fingerprint image of the fingertip of human being who has individual difference like the desiccation skin or the oily skin skin.

[0004]

[Means for Solving the Problem] The capacity mold sensor chip with which this invention consists of a semi-conductor which detects a fingerprint in order to solve such a technical problem, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, The setting section which sets up the parameter of said storage section to a capacity mold sensor chip, The control section which this capacity mold sensor chip is started [ control section ] and makes fingerprint image data detect is prepared after a setup of the parameter to the capacity mold sensor chip by the setting section. The fingerprint authentication section The fingerprint image and the fingerprint data of the storage section which were detected with this capacity mold sensor chip after starting of the capacity mold sensor chip of a control section are collated, and it is made to perform fingerprint authentication. Moreover, the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news, the detecting element which detects contact of the finger to a capacity mold sensor chip is prepared, and after contact of a finger is detected by the detecting element, a control section starts a capacity mold sensor chip, and makes detection of a fingerprint image start after latency-time progress of the storage section. Moreover, while preparing the storage section which keeps individual humanity news in an IC card, a capacity mold sensor chip, the fingerprint authentication section, the setting section, a control section, and a detecting element are prepared in IC card reader which reads the data of an IC card.

[0005]

[Embodiment of the Invention] Hereafter, this invention is explained with reference to a drawing. Drawing 1 is the block diagram showing the configuration of the fingerprint collation device concerning this invention. This fingerprint collation device consists of an IC card reader 1 and IC card 2, as shown in drawing 1. The IC card reader 1 consists of the semi-conductor capacity mold sensor chip (henceforth, sensor chip) 11 which detects the fingerprint of the finger 3 stamped by the user, the control section 12 which inputs the fingerprint image data detected with the sensor chip 11, and performs predetermined processing, memory 13 which accumulates the fingerprint image data inputted by the control section 12, a display 14 which performs various kinds of displays, and an interface 15 with IC card 2.

[0006] The sensor chip 11 consists of sensor section 11A and A/D-conversion section 11B which the fingerprint image detected by the sensor section 11 is digitized, and is outputted to a control section 12 as fingerprint image data. Moreover, a control section 12 builds in timer 12A. Furthermore, IC card 2 has the interface 21 with the IC card reader 1, and the memory 22 which registers a user's fingerprint image data.

[0007] As mentioned above by A/D-conversion section 11B, the voltage signal which sensor section 11A of the sensor chip 11 which constitutes the IC card reader 1 generated the capacity difference according to the irregularity (namely, fingerprint) of the front face of the skin of the finger 3 which contacted when a user's finger 3 was stamped, outputs it as a voltage signal, and was outputted by sensor section 11A is changed into a digital signal, and is outputted to a control section 11 as fingerprint image data.

[0008] Drawing 2 and drawing 3 are drawings showing the configuration of sensor section 11A in the above-mentioned sensor chip 11. Sensor section 11A consists of two or more sensors 4 arranged in the shape of a grid, as shown in drawing 2, and the sensor 4 which is one unit sensor consists of the sensing element 41 which is a capacitive element as shown in drawing 3, a signal generating circuit 42, a signal amplifying circuit 43, and an output circuit 44. And if a finger 3 contacts, the capacity difference according to the irregularity of the front face of the skin of the finger 3 which contacted in the sensing element 41 of each sensor 4, respectively occurs, and it has the composition that the voltage signal according to this capacity difference is amplified by the signal amplifying circuit 43, and is outputted to A/D-conversion section 11B from an output circuit 44.

[0009] Although A/D-conversion section 11B which constitutes the sensor chip 11 changes into digital value the analog voltage level (analog value) outputted from the output circuit 44 of a sensor 4, according to the parameter value set up, the correspondence relation between an analog value and digital value changes. The parameter value A and B as shows the parameter set as A/D-conversion section 11B to drawing 4 is set up.

[0010] Now, if the analog value inputted into A/D-conversion section 11B is the level of under an active-parameter value ( $A+B$ ), the deep-black fingerprint image of gradation 0 shall be obtained from A/D-conversion section 11B. Moreover, if the analog value inputted into A/D-conversion section 11B is beyond an active-parameter value ( $A+(255 \times B)$ ), the pure white fingerprint image of gradation 255 shall be obtained from A/D-conversion section 11B. furthermore, the analog value inputted into A/D-conversion section 11B -- more than parameter value ( $A+n \times B$ ) -- and if it is the level of under parameter value ( $A+(n+1) \times B$ ), the fingerprint image of Gradation n shall be obtained from A/D-conversion section 11B

[0011] Thus, if parameter value A is set as size, the fingerprint image obtained from A/D-conversion section 11B will become black, and if parameter value A is set as smallness, the fingerprint image obtained from A/D-conversion section 11B will become white. Moreover, if parameter value B is set as size, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become coarse, and if parameter value B is set as smallness, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become fine. Thus, the brightness and resolution of a fingerprint image which are obtained from A/D-conversion section 11B are changeable by changing the parameter value of A/D-conversion section 11B. Therefore, when detecting the fingerprint image of the fingertip of human being who has individual difference like the desiccation skin or the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference from A/D-conversion section 11B can be made to output by setting the parameter value according to such individual difference as A/D-conversion section 11B.

[0012] Drawing 5 is a flow chart which shows important section-actuation of this fingerprint collation device, and shows reading actuation of the fingerprint by the sensor chip 11. Important section actuation of this invention is explained to a detail according to this flow

chart. By the way, while the fingerprint image data of a user proper is registered into the memory 22 of IC card 2, registration storage of the parameter value A and B of this user proper set as A/D-conversion section 11B in the sensor chip 11 mentioned above and the latency time until A/D-conversion section 11B starts conversion actuation is carried out as a user's individual humanity news.

[0013] If such IC card 2 is inserted in the IC card reader 1 by the user, first, in step S1, the control section 12 of the IC card reader 1 will read a user's fingerprint image data, parameter value, and the latency time in the memory 22 of IC card 2, and will memorize them in memory 13. Next, a control section 12 sets said latency time as timer 12A at step S3 while setting this parameter value as A/D-conversion section 11B through the signal line a shown in drawing 1 R at step S2.

[0014] Next, if a control section 12 makes a detection judgment through the signal line b which shows drawing 1 whether a user's finger 3 was stamped on sensor section 11A in the sensor chip 11 by step S4 and stamp of a finger 3 is detected, it will start timer 12A at step S5. And if the existence of deadline of timer 12A is judged at step S6 and timer 12A passes the deadline of, A/D-conversion section 11B will be started through the signal line c shown in drawing 1 at step S7.

[0015] Then, a control section 11 reads the fingerprint image data which was detected by sensor section 11A and digitized by A/D-conversion section 11B one by one at step S8, and carries out sequential storage at memory 13. If reading of all fingerprint image data is completed and the judgment of step S9 is set to "Y" Collating processing with the fingerprint image data which read in the sensor chip 11 and was memorized in memory 13, and the fingerprint image data which read in the memory 22 of IC card 2, and was memorized in memory 13 is performed at step S10.

[0016] and -- if a quality judgment about the result of said collating processing is made at step S11, the fingerprint image data read in the sensor chip 11 and the fingerprint image data read in IC card 2 are in agreement and the judgment of step S11 is set to "Y" -- step S12 -- a display 14 -- him of a "he authentication" purport -- it displays by performing a check result output.

[0017] Thus, when detecting the fingerprint image of the fingertip of human beings who have individual difference, such as the desiccation skin and the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference can be made to output from A/D-conversion section 11B by having constituted so that the parameter value according to such individual difference might be set as A/D-conversion section 11B. Furthermore, in case the fingerprint image of the fingertip of human being who has individual difference is detected, the more exact fingerprint image which is not influenced by the above individual difference can be obtained by having set up the detection latency time of the sensor chip 11 according to the above individual difference.

[0018]

[Effect of the Invention] The capacity mold sensor chip which consists of a semi-conductor which detects a fingerprint according to this invention as explained above, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, Since the setting section which sets up the parameter of the storage section to a capacity mold sensor chip is prepared, this capacity mold sensor chip after a setup of the parameter to the capacity mold sensor chip by the setting section is started and it was made to make fingerprint image data detect When detecting the fingerprint image of the fingertip of human beings who have a difference for every each people, such as the desiccation skin and the oily skin skin Since the parameter according to such individual difference is set as a capacity mold sensor chip, it becomes possible to make the exact fingerprint image which is not influenced by the above individual difference from a capacity mold sensor chip output. Moreover, while the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news Since a capacity mold sensor chip is started and it was made to make detection of a fingerprint image start after latency-time progress of the storage section after it prepared the detecting element which detects contact of the finger to a capacity mold sensor chip and contact of a finger was detected by the detecting element Since the detection latency time of a capacity mold sensor chip is set up according to the above individual difference in case the fingerprint image of the fingertip of human being who has individual difference is detected, it becomes possible to make the more exact fingerprint image which is

not influenced by such individual difference from a capacity mold sensor chip output. Moreover, since a capacity mold sensor chip, the fingerprint authentication section, the setting section, the control section, and the detecting element were prepared in IC card reader which reads the data of an IC card while preparing the storage section which keeps individual humanity news in the IC card, each user can carry out management storage of the own individual humanity news exactly.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the fingerprint collation device which performs collating with the fingerprint data registered beforehand and the fingerprint data detected by the semi-conductor capacity mold sensor.

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PRIOR ART

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[Description of the Prior Art] The semi-conductor capacity mold sensor used for this kind of fingerprint collation device detects the irregularity of human being's fingerprint as a capacity difference, and generates it as a shade image. Said fingerprint collation device registers a user's fingerprint data beforehand, when attesting a user using a fingerprint. and -- if the fingerprint data which generated fingerprint data and were generated from the detected fingerprint image are compared with said fingerprint data registered and both are in agreement, while making the irregularity of this user's fingerprint detect as a fingerprint image based on the capacity difference of a capacity mold sensor as mentioned above, when a user's finger is stamped on said semi-conductor capacity mold sensor -- a user -- it is recognized as his being him.  
[0003]

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EFFECT OF THE INVENTION

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[Effect of the Invention] The capacity mold sensor chip which consists of a semi-conductor which detects a fingerprint according to this invention as explained above, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, Since the setting section which sets up the parameter of the storage section to a capacity mold sensor chip is prepared, this capacity mold sensor chip after a setup of the parameter to the capacity mold sensor chip by the setting section is started and it was made to make fingerprint image data detect When detecting the fingerprint image of the fingertip of human beings who have a difference for every each people, such as the desiccation skin and the oily skin skin Since the parameter according to such individual difference is set as a capacity mold sensor chip, it becomes possible to make the exact fingerprint image which is not influenced by the above individual difference from a capacity mold sensor chip output. Moreover, while the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news Since a capacity mold sensor chip is started and it was made to make detection of a fingerprint image start after latency-time progress of the storage section after it prepared the detecting element which detects contact of the finger to a capacity mold sensor chip and contact of a finger was detected by the detecting element Since the detection latency time of a capacity mold sensor chip is set up according to the above individual difference in case the fingerprint image of the fingertip of human being who has individual difference is detected, it becomes possible to make the more exact fingerprint image which is not influenced by such individual difference from a capacity mold sensor chip output. Moreover, since a capacity mold sensor chip, the fingerprint authentication section, the setting section, the control section, and the detecting element were prepared in IC card reader which reads the data of an IC card while preparing the storage section which keeps individual humanity news in the IC card, each user can carry out management storage of the own individual humanity news exactly.

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MEANS

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[Means for Solving the Problem] The capacity mold sensor chip with which this invention consists of a semi-conductor which detects a fingerprint in order to solve such a technical problem. The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, The setting section which sets up the parameter of said storage section to a capacity mold sensor chip, The control section which this capacity mold sensor chip is started [ control section ] and makes fingerprint image data detect is prepared after a setup of the parameter to the capacity mold sensor chip by the setting section. The fingerprint authentication section The fingerprint image and the fingerprint data of the storage section which were detected with this capacity mold sensor chip after starting of the capacity mold sensor chip of a control section are collated, and it is made to perform fingerprint authentication. Moreover, the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news, the detecting element which detects contact of the finger to a capacity mold sensor chip is prepared, and after contact of a finger is detected by the detecting element, a control section starts a capacity mold sensor chip, and makes detection of a fingerprint image start after latency-time progress of the storage section. Moreover, while preparing the storage section which keeps individual humanity news in an IC card, a capacity mold sensor chip, the fingerprint authentication section, the setting section, a control section, and a detecting element are prepared in IC card reader which reads the data of an IC card.

[0005]

[Embodiment of the Invention] Hereafter, this invention is explained with reference to a drawing. Drawing 1 is the block diagram showing the configuration of the fingerprint collation device concerning this invention. This fingerprint collation device consists of an IC card reader 1 and IC card 2, as shown in drawing 1. The IC card reader 1 consists of the semi-conductor capacity mold sensor chip (henceforth, sensor chip) 11 which detects the fingerprint of the finger 3 stamped by the user, the control section 12 which inputs the fingerprint image data detected with the sensor chip 11, and performs predetermined processing, memory 13 which accumulates the fingerprint image data inputted by the control section 12, a display 14 which performs various kinds of displays, and an interface 15 with IC card 2.

[0006] The sensor chip 11 consists of sensor section 11A and A/D-conversion section 11B which the fingerprint image detected by the sensor section 11 is digitized, and is outputted to a control section 12 as fingerprint image data. Moreover, a control section 12 builds in timer 12A. Furthermore, IC card 2 has the interface 21 with the IC card reader 1, and the memory 22 which registers a user's fingerprint image data.

[0007] As mentioned above by A/D-conversion section 11B, the voltage signal which sensor section 11A of the sensor chip 11 which constitutes the IC card reader 1 generated the capacity difference according to the irregularity (namely, fingerprint) of the front face of the skin of the finger 3 which contacted when a user's finger 3 was stamped, outputs it as a voltage signal, and was outputted by sensor section 11A is changed into a digital signal, and is outputted to a control section 11 as fingerprint image data.

[0008] Drawing 2 and drawing 3 are drawings showing the configuration of sensor section 11A in the above-mentioned sensor chip 11. Sensor section 11A consists of two or more sensors 4 arranged in the shape of a grid, as shown in drawing 2, and the sensor 4 which is one unit sensor consists of the sensing element 41 which is a capacitive element as shown in drawing

3, a signal generating circuit 42, a signal amplifying circuit 43, and an output circuit 44. And if a finger 3 contacts, the capacity difference according to the irregularity of the front face of the skin of the finger 3 which contacted in the sensing element 41 of each sensor 4, respectively occurs, and it has the composition that the voltage signal according to this capacity difference is amplified by the signal amplifying circuit 43, and is outputted to A/D-conversion section 11B from an output circuit 44.

[0009] Although A/D-conversion section 11B which constitutes the sensor chip 11 changes into digital value the analog voltage level (analog value) outputted from the output circuit 44 of a sensor 4, according to the parameter value set up, the correspondence relation between an analog value and digital value changes. The parameter value A and B as shows the parameter set as A/D-conversion section 11B to drawing 4 is set up.

[0010] Now, if the analog value inputted into A/D-conversion section 11B is the level of under an active-parameter value ( $A+B$ ), the deep-black fingerprint image of gradation 0 shall be obtained from A/D-conversion section 11B. Moreover, if the analog value inputted into A/D-conversion section 11B is beyond an active-parameter value ( $A+(255 \times B)$ ), the pure white fingerprint image of gradation 255 shall be obtained from A/D-conversion section 11B. furthermore, the analog value inputted into A/D-conversion section 11B -- more than parameter value ( $A+n \times B$ ) -- and if it is the level of under parameter value ( $A+(n+1) \times B$ ), the fingerprint image of Gradation n shall be obtained from A/D-conversion section 11B.

[0011] Thus, if parameter value A is set as size, the fingerprint image obtained from A/D-conversion section 11B will become black, and if parameter value A is set as smallness, the fingerprint image obtained from A/D-conversion section 11B will become white. Moreover, if parameter value B is set as size, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become coarse, and if parameter value B is set as smallness, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become fine. Thus, the brightness and resolution of a fingerprint image which are obtained from A/D-conversion section 11B are changeable by changing the parameter value of A/D-conversion section 11B. Therefore, when detecting the fingerprint image of the fingertip of human being who has individual difference like the desiccation skin or the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference from A/D-conversion section 11B can be made to output by setting the parameter value according to such individual difference as A/D-conversion section 11B.

[0012] Drawing 5 is a flow chart which shows important section actuation of this fingerprint collation device, and shows reading actuation of the fingerprint by the sensor chip 11. Important section actuation of this invention is explained to a detail according to this flow chart. By the way, while the fingerprint image data of a user proper is registered into the memory 22 of IC card 2, registration storage of the parameter value A and B of this user proper set as A/D-conversion section 11B in the sensor chip 11 mentioned above and the latency time until A/D-conversion section 11B starts conversion actuation is carried out as a user's individual humanity news.

[0013] If such IC card 2 is inserted in the IC card reader 1 by the user, first, in step S1, the control section 12 of the IC card reader 1 will read a user's fingerprint image data, parameter value, and the latency time in the memory 22 of IC card 2, and will memorize them in memory 13. Next, a control section 12 sets said latency time as timer 12A at step S3 while setting this parameter value as A/D-conversion section 11B through the signal line a shown in drawing 1 R> 1 at step S2.

[0014] Next, if a control section 12 makes a detection judgment through the signal line b which shows drawing 1 whether a user's finger 3 was stamped on sensor section 11A in the sensor chip 11 by step S4 and stamp of a finger 3 is detected, it will start timer 12A at step S5. And if the existence of deadline of timer 12A is judged at step S6 and timer 12A passes the deadline of, A/D-conversion section 11B will be started through the signal line c shown in drawing 1 at step S7.

[0015] Then, a control section 11 reads the fingerprint image data which was detected by sensor section 11A and digitized by A/D-conversion section 11B one by one at step S8, and carries out sequential storage at memory 13. If reading of all fingerprint image data is completed and the judgment of step S9 is set to "Y" Collating processing with the fingerprint image data which read in the sensor chip 11 and was memorized in memory 13, and the fingerprint image data which read in the memory 22 of IC card 2, and was memorized in memory 13 is performed at step S10.

[0016] and -- if a quality judgment about the result of said collating processing is made at step S11, the fingerprint image data read in the sensor chip 11 and the fingerprint image data

read in IC card 2 are in agreement and the judgment of step S11 is set to "Y" -- step S12 -- a display 14 -- him of a "he authentication" purport -- it displays by performing a check result output.

[0017] Thus, when detecting the fingerprint image of the fingertip of human beings who have individual difference, such as the desiccation skin and the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference can be made to output from A/D-conversion section 11B by having constituted so that the parameter value according to such individual difference might be set as A/D-conversion section 11B.

Furthermore, in case the fingerprint image of the fingertip of human being who has individual difference is detected, the more exact fingerprint image which is not influenced by the above individual difference can be obtained by having set up the detection latency time of the sensor chip 11 according to the above individual difference.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration of the fingerprint collation device concerning this invention.

[Drawing 2] It is drawing showing the configuration of the fingerprint sensor section in the semi-conductor capacity mold sensor chip of said fingerprint collation device.

[Drawing 3] It is the block diagram showing the configuration of one detection unit in said semi-conductor capacity mold sensor chip.

[Drawing 4] It is drawing showing the situation of the parameter set as the A/D-conversion section in said semi-conductor capacity mold sensor chip.

[Drawing 5] It is the flow chart which shows important section actuation of a fingerprint collation device.

[Description of Notations]

1 [ -- A sensor, 11 / -- A semi-conductor capacity mold sensor 11A / -- The sensor section, 11 B--A/D transducer, 12 / -- A control section, 12A / -- 13 A timer, 22 / -- Memory, 14 / -- 15 A display, 21 / -- An interface, 41 / -- A sensing element, 42 / -- A signal generating circuit, 43 / -- A signal amplifying circuit, 44 / -- Output circuit. ] -- IC card reader, 2 -- An IC card, 3 -- A finger, 4

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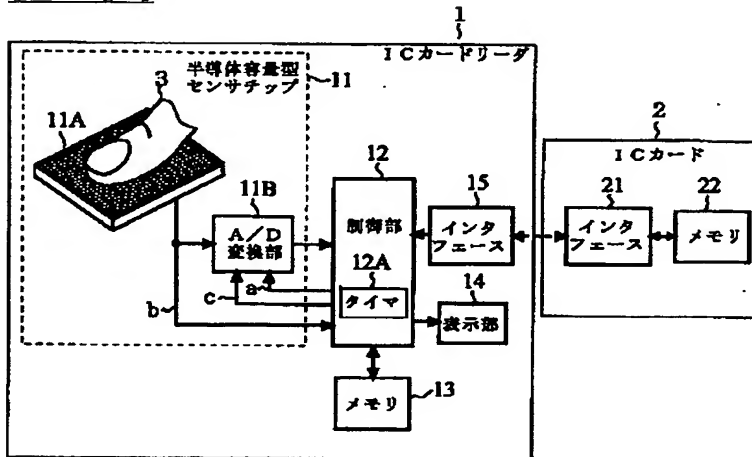
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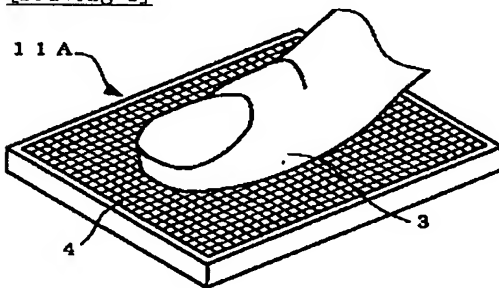
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## DRAWINGS

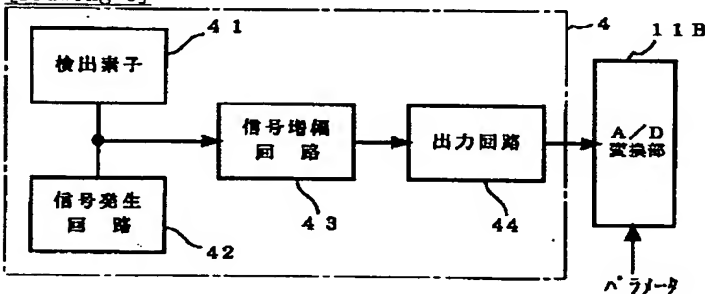
[Drawing 1]



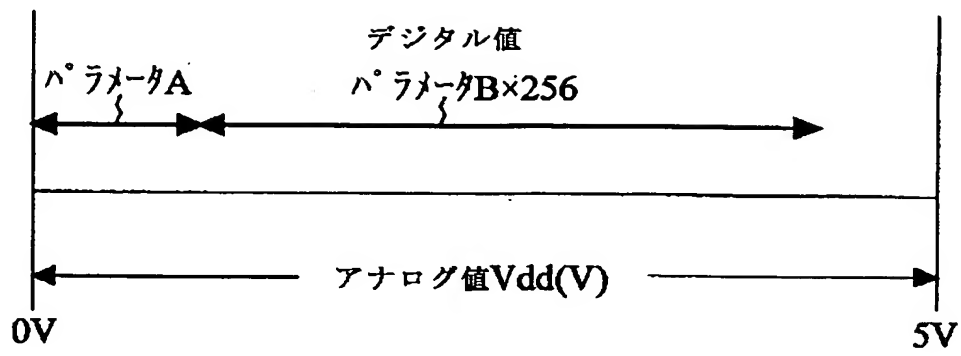
[Drawing 2]



[Drawing 3]

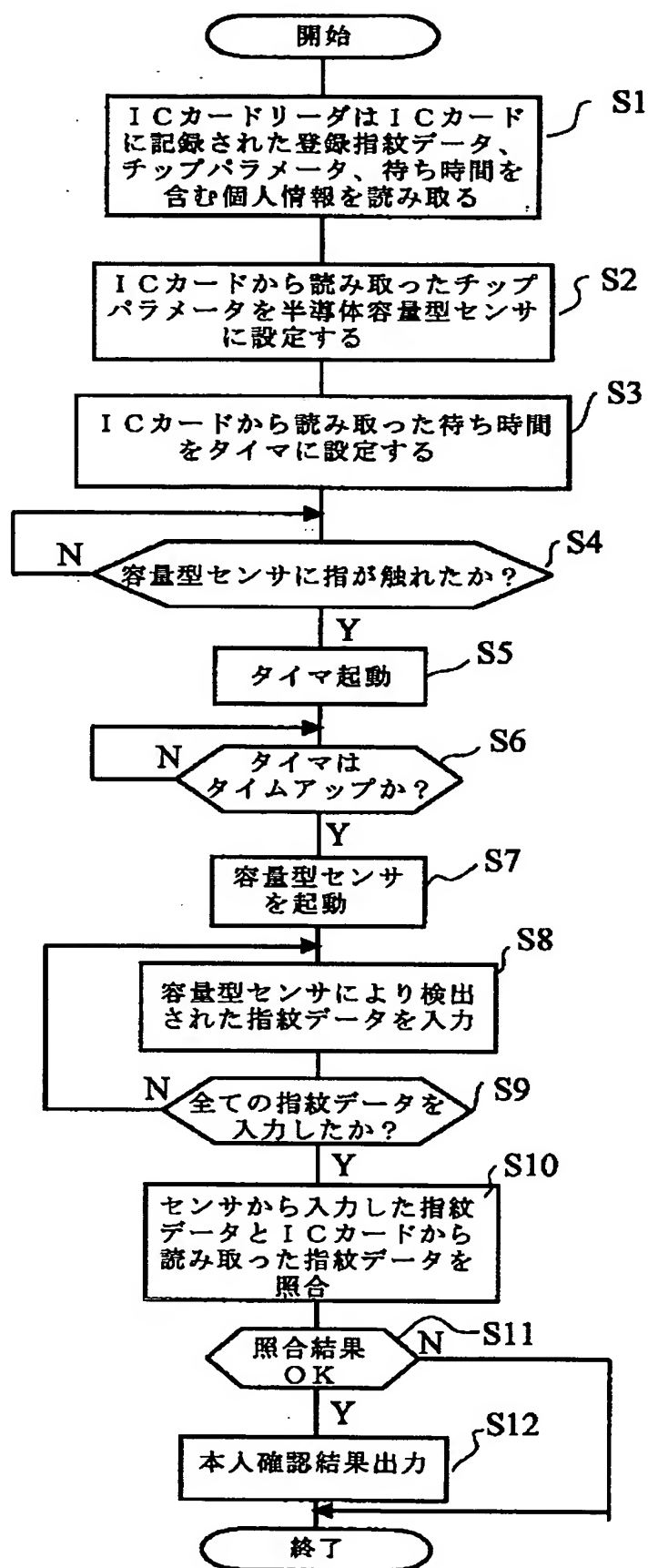


[Drawing 4]



[Drawing 5]





[Translation done.]

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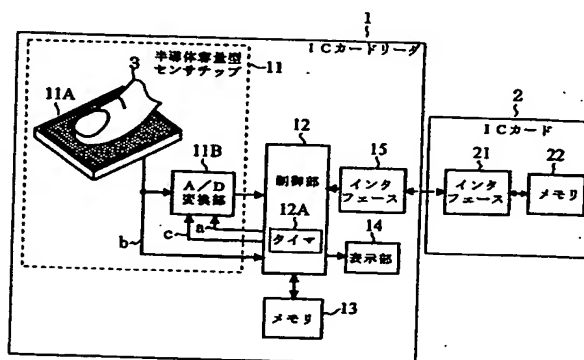
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(54) 【発明の名称】 指紋照合装置

(57) 【要約】

【課題】 乾燥肌や脂性肌等のように個人差を有する人間の指先の指紋画像を検出する場合に的確な検出を行う。

【解決手段】 ICカード2がICカードリーダ1に挿入されると、ICカードリーダはICカードから利用者特有の指紋データ、パラメータ及び待ち時間を読み取り、この利用者特有のパラメータをセンサチップ11のA/D変換部11Bに設定し、かつ利用者特有の待ち時間をタイマ12Aに設定する。利用者の指3がセンサチップに押捺されるとタイマを起動し、タイマのタイムアップ後センサチップを起動して指3の指紋を検出させる。そして、センサチップが検出した指紋データとICカードからの指紋データを照合して利用者本人の認証を行う。



## 【特許請求の範囲】

【請求項 1】 指紋を検出する半導体からなる容量型センサチップと、

利用者の指紋画像データ及び前記容量型センサチップのパラメータを含む個人情報を保管する保管部と、  
前記容量型センサチップにより検出された指紋画像データと前記保管部の指紋データとを照合する指紋照合部と、

前記容量型センサチップに対して前記保管部のパラメータを設定する設定部と、

前記設定部による前記容量型センサチップへのパラメータの設定後、この容量型センサチップを起動し前記指紋画像データを検出させる制御部とを備え、前記指紋照合部は、前記制御部の前記容量型センサチップの起動後にこの容量型センサチップにより検出された指紋画像と前記保管部の指紋データとを照合して指紋認証を行うことを特徴とする指紋照合装置。

【請求項 2】 請求項 1 において、

前記保管部は、前記容量型センサチップの指紋画像検出時の待ち時間を前記個人情報として保管し、  
前記容量型センサチップへの指の接触を検出する検出部を備え、

前記制御部は、前記検出部により指の接触が検出された後、前記保管部の待ち時間経過後に前記容量型センサチップを起動し前記指紋画像の検出を開始させることを特徴とする指紋照合装置。

【請求項 3】 請求項 1 または請求項 2 において、  
前記個人情報を保管する前記保管部を IC カードに設けるとともに、前記 IC カードのデータを読み取る IC カードリーダを設け、前記 IC カードリーダに前記容量型センサチップ、前記指紋照合部、前記設定部、前記制御部及び検出部を設けることを特徴とする指紋照合装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、予め登録された指紋データと半導体容量型センサにより検出された指紋データとの照合を行う指紋照合装置に関する。

## 【0002】

【従来の技術】この種の指紋照合装置に用いられる半導体容量型センサは、人間の指紋の凹凸を容量差として検出し濃淡画像として生成するものである。前記指紋照合装置は、指紋を用いて利用者の認証を行う場合、予め利用者の指紋データを登録する。そして、前記半導体容量型センサ上に利用者の指が押捺されると、この利用者の指紋の凹凸を前述のように容量型センサの容量差に基づく指紋画像として検出させるとともに、検出した指紋画像から指紋データを生成して、生成した指紋データと前記登録されている指紋データとを比較し、両者が一致すると利用者本人であると認識するものである。

## 【0003】

【発明が解決しようとする課題】一般に、人間の指先は乾燥肌や脂性肌等のように個人差がある。従来の指紋照合装置は、このような個人差を有する人間の指先の指紋画像を、半導体容量型センサが個人差に無関係に同一条件で検出しているため、照合に必要な的確な指紋画像が得られないという課題があった。したがって、本発明は、乾燥肌や脂性肌等のように個人差を有する人間の指先の指紋画像を検出する場合に的確な検出を行うことを目的とする。

## 【0004】

【課題を解決するための手段】このような課題を解決するために本発明は、指紋を検出する半導体からなる容量型センサチップと、利用者の指紋画像データ及び容量型センサチップのパラメータを含む個人情報を保管する保管部と、容量型センサチップにより検出された指紋画像データと保管部の指紋データとを照合する指紋照合部と、容量型センサチップに対して前記保管部のパラメータを設定する設定部と、設定部による容量型センサチップへのパラメータの設定後、この容量型センサチップを起動し指紋画像データを検出させる制御部とを設け、指紋照合部は、制御部の容量型センサチップの起動後にこの容量型センサチップにより検出された指紋画像と保管部の指紋データとを照合して指紋認証を行うようにしたものである。また、保管部は、容量型センサチップの指紋画像検出時の待ち時間を個人情報として保管し、容量型センサチップへの指の接触を検出する検出部を設け、制御部は、検出部により指の接触が検出された後、保管部の待ち時間経過後に容量型センサチップを起動し指紋画像の検出を開始させるものである。また、個人情報を保管する保管部を IC カードに設けるとともに、IC カードのデータを読み取る IC カードリーダに、容量型センサチップ、指紋照合部、設定部、制御部及び検出部を設けたものである。

## 【0005】

【発明の実施の形態】以下、本発明について図面を参照して説明する。図 1 は本発明に係る指紋照合装置の構成を示すブロック図である。本指紋照合装置は、図 1 に示すように、IC カードリーダ 1 と、IC カード 2 とからなる。IC カードリーダ 1 は、利用者により押捺された指 3 の指紋を検出する半導体容量型センサチップ（以下、センサチップ）11 と、センサチップ 11 により検出された指紋画像データを入力して所定の処理を行う制御部 12 と、制御部 12 により入力された指紋画像データを蓄積するメモリ 13 と、各種の表示を行う表示部 14 と、IC カード 2 とのインタフェース 15 とから構成される。

【0006】センサチップ 11 は、センサ部 11A と、センサ部 11 により検出された指紋画像をデジタル化して指紋画像データとして制御部 12 へ出力する A/D 変換部 11B とからなる。また、制御部 12 はタイマ 12

Aを内蔵する。さらに、ICカード2は、ICカードリーダー1とのインタフェース21と、利用者の指紋画像データを登録するメモリ22とを有する。

【0007】ICカードリーダー1を構成するセンサチップ11のセンサ部11Aは、利用者の指3が押捺されると、接触した指3の皮膚の表面の凹凸（即ち、指紋）に応じた容量差を発生し電圧信号として出力するもので、センサ部11Aにより出力された電圧信号はA/D変換部11Bにより前述したようにデジタル信号に変換され指紋画像データとして制御部11に出力される。

【0008】図2及び図3は前述のセンサチップ11内のセンサ部11Aの構成を示す図である。センサ部11Aは、図2に示すように昇目状に配置された複数のセンサ4からなり、1つの単位センサであるセンサ4は図3に示すように容量素子である検出素子41と、信号発生回路42と、信号増幅回路43と、出力回路44とからなる。そして、指3が接触すると、各センサ4の検出素子41においてはそれぞれ接触した指3の皮膚の表面の凹凸に応じた容量差が発生し、この容量差に応じた電圧信号が信号増幅回路43により増幅されて出力回路44からA/D変換部11Bへ出力されるような構成となっている。

【0009】センサチップ11を構成するA/D変換部11Bは、センサ4の出力回路44から出力されるアナログ電圧レベル（アナログ値）をデジタル値に変換するものであるが、設定されるパラメータ値に応じてアナログ値とデジタル値との対応関係が変化する。A/D変換部11Bに設定されるパラメータは、図4に示すようなパラメータ値A、Bが設定される。

【0010】いま、A/D変換部11Bに入力されたアナログ値が設定パラメータ値（A+B）未満のレベルであればA/D変換部11Bから階調0の真っ黒の指紋画像が得られるものとする。また、A/D変換部11Bに入力されたアナログ値が設定パラメータ値（A+（255×B））以上であればA/D変換部11Bから階調255の真っ白の指紋画像が得られるものとする。さらに、A/D変換部11Bに入力されたアナログ値がパラメータ値（A+n×B）以上でかつパラメータ値（A+（n+1）B）未満のレベルであればA/D変換部11Bから階調nの指紋画像が得られるものとする。

【0011】このように、パラメータ値Aを大に設定するとA/D変換部11Bから得られる指紋画像は黒くなり、パラメータ値Aを小に設定するとA/D変換部11Bから得られる指紋画像は白くなる。また、パラメータ値Bを大に設定するとA/D変換部11Bから得られる指紋画像の分解能は粗くなり、パラメータ値Bを小に設定するとA/D変換部11Bから得られる指紋画像の分解能は細くなる。このようにしてA/D変換部11Bのパラメータ値を変えることによりA/D変換部11Bから得られる指紋画像の輝度や分解能を変えることがで

きる。したがって、乾燥肌や脂性肌等のように個人差を有する人間の指先の指紋画像を検出する場合に、こうした個人差に応じたパラメータ値をA/D変換部11Bに設定することにより、A/D変換部11Bから前記のような個人差に影響されない的確な指紋画像を出力させることができる。

【0012】図5は本指紋照合装置の要部動作を示すフローチャートであり、センサチップ11による指紋の読み取り動作を示すものである。このフローチャートにしたがい本発明の要部動作を詳細に説明する。ところで、ICカード2のメモリ22には、利用者固有の指紋画像データが登録されているとともに、前述したセンサチップ11内のA/D変換部11Bに設定されるこの利用者固有のパラメータ値A、B、及びA/D変換部11Bが変換動作を開始するまでの待ち時間が利用者の個人情報として登録保管されている。

【0013】こうしたICカード2が利用者によりICカードリーダー1に挿入されると、ICカードリーダー1の制御部12はまずステップS1において、ICカード2のメモリ22から利用者の指紋画像データ、パラメータ値及び待ち時間を読み取ってメモリ13に記憶する。次に、制御部12はステップS2でこのパラメータ値を図1に示す信号線aを介してA/D変換部11Bに設定するとともに、前記待ち時間をステップS3でタイマ12Aに設定する。

【0014】次に制御部12は、ステップS4で利用者の指3がセンサチップ11内のセンサ部11Aに押捺されたか否かを図1に示す信号線bを介して検出判断し、指3の押捺を検出すると、ステップS5でタイマ12Aを起動する。そして、ステップS6でタイマ12Aのタイムアップの有無を判断し、タイマ12AがタイムアップするとステップS7でA/D変換部11Bを図1に示す信号線cを介して起動する。

【0015】その後、制御部11は、センサ部11Aにより検出されA/D変換部11Bによりデジタル化された指紋画像データをステップS8で順次読み取ってメモリ13に順次記憶し、全ての指紋画像データの読み取りが終了してステップS9の判定が「Y」となると、センサチップ11から読み取りメモリ13に記憶した指紋画像データと、ICカード2のメモリ22から読み取りメモリ13に記憶した指紋画像データとの照合処理をステップS10で行う。

【0016】そして、前記照合処理の結果についての良否判断をステップS11で行い、センサチップ11から読み取った指紋画像データとICカード2から読み取った指紋画像データが一致しステップS11の判定が

「Y」となると、ステップS12で表示部14に「本人認証」旨の本人確認結果出力を行い表示する。

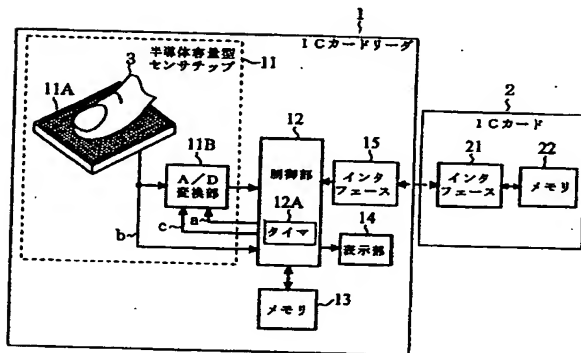
【0017】このように、乾燥肌や脂性肌等、個人差を有する人間の指先の指紋画像を検出する場合に、こうし

た個人差に応じたパラメータ値をA/D変換部11Bに設定するように構成したことにより、前記のような個人差に影響されない、正確な指紋画像をA/D変換部11Bから出力させることができる。さらに、個人差を有する人間の指先の指紋画像を検出する際には、前記のような個人差に応じてセンサチップ11の検出待ち時間を設定するようにしたことにより、前記のような個人差に影響されない、より正確な指紋画像を得ることができる。

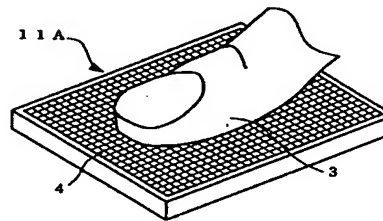
【0018】

【発明の効果】以上説明したように本発明によれば、指紋を検出する半導体からなる容量型センサチップと、利用者の指紋画像データ及び容量型センサチップのパラメータを含む個人情報を保管する保管部と、容量型センサチップにより検出された指紋画像データと保管部の指紋データとを照合する指紋照合部と、容量型センサチップに対して保管部のパラメータを設定する設定部とを設け、設定部による容量型センサチップへのパラメータの設定後、この容量型センサチップを起動し指紋画像データを検出させるようにしたので、乾燥肌や脂性肌等、各個人毎に差がある人間の指先の指紋画像を検出する場合に、こうした個人差に応じたパラメータが容量型センサチップに設定されることから、容量型センサチップからは前記のような個人差に影響されない、的確な指紋画像を出力させることが可能になる。また、保管部は、容量型センサチップの指紋画像検出時の待ち時間を個人情報として保管するとともに、容量型センサチップへの指の接触を検出する検出部を設け、検出部により指の接触が検出された後、保管部の待ち時間経過後に容量型センサチップを起動し指紋画像の検出を開始させるようにした

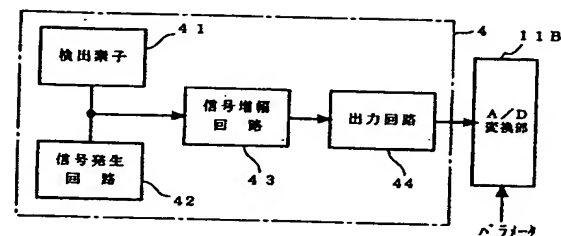
【図1】



【図2】



【図3】



ので、個人差を有する人間の指先の指紋画像を検出する際には前記のような個人差に応じて容量型センサチップの検出待ち時間が設定されることから、容量型センサチップからはこうした個人差に影響されない、より正確な指紋画像を出力させることが可能になる。また、個人情報を保管する保管部をICカードに設けるとともに、ICカードのデータを読み取るICカードリーダに、容量型センサチップ、指紋照合部、設定部、制御部及び検出部を設けるようにしたので、各利用者は自身の個人情報を的確に管理保管できる。

【図面の簡単な説明】

【図1】 本発明に係る指紋照合装置の構成を示すブロック図である。

【図2】 前記指紋照合装置の半導体容量型センサチップ内の指紋センサ部の構成を示す図である。

【図3】 前記半導体容量型センサチップ内の1つの検出単位の構成を示すブロック図である。

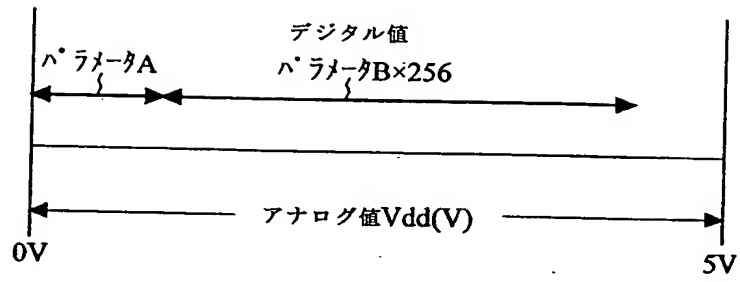
【図4】 前記半導体容量型センサチップ内のA/D変換部に設定されるパラメータの状況を示す図である。

【図5】 指紋照合装置の要部動作を示すフローチャートである。

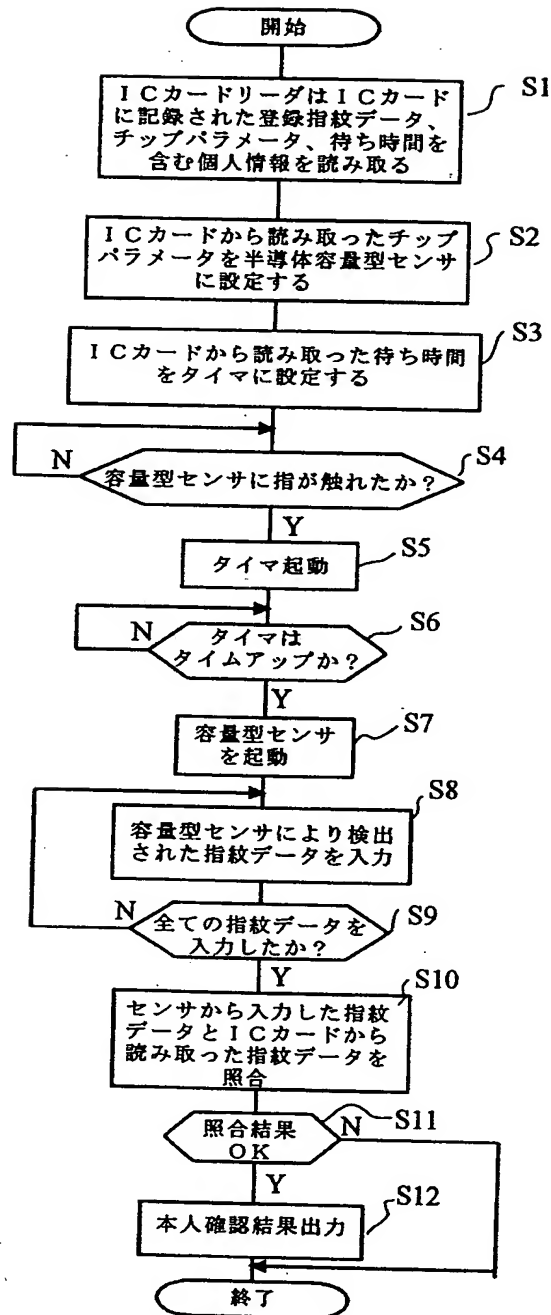
【符号の説明】

1…ICカードリーダ、2…ICカード、3…指、4…センサ、11…半導体容量型センサ、11A…センサ部、11B…A/D変換部、12…制御部、12A…タイマ、13、22…メモリ、14…表示部、15、21…インタフェース、41…検出素子、42…信号発生回路、43…信号増幅回路、44…出力回路。

【図4】



【図5】



フロントページの続き

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